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FOR REFERENCE ONLY

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PRODUCT ASSURANCE

CALIBRATION/~~SERVICE~~ PROCEDURE

PULSE/FUNCTION GENERATOR

HEWLETT PACKARD MODEL 8116A

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REVISIONS

DATE	REV BY	PAGE AFFECTED	REMARKS
09-26-90	DWY	all	Original
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SECTION 1
INTRODUCTION

1.1 The following procedure shall be used for calibration of typical portable or panel type meters. Meters should be held in their intended operating position, and on steel panels if required, for calibration.

SECTION 2
REFERENCE

2.1 Applicable Manufacturer's Manuals or Brochures.

2.2 QECL Calibration Recall Information System (CRIS) New CRIS User Guide.

2.3 Applicable Manufacturers/Model Number Calibration Record Form 962-X.

2.4 Environmental Requirement for Calibration Operation per Quality Assurance DOI 2.6.1-13.

SECTION 3
SPECIFICATIONS

3.1 The specifications are listed in the CRIS system by applicable Metrology number. The specifications may be viewed by calling up the Model Spec screen per the New CRIS User Guide.

SECTION 4
PRELIMINARY NOTES

4.1 For Service Required, use Service Procedure, Electrical and Electronic, No 1000.

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SECTION 5
STANDARDS REQUIRED

5.1 The Standards listed below have been selected on the basis of their higher accuracy level when compared to the unit under test. Equivalent Standards must be equal to or better than the Minimum-Use-Specification.

5.2 Minimum-Use-Specifications for the Standards listed are ¼ the accuracy required by the Test Instrument.

STANDARD USED	MINIMUM-USE-SPECIFICATION	MANUFACTURER MODEL
5.3 Frequency Counter	Time Base: ± 0.06% Range: all	Hewlett Packard Model 5345A
5.4 Oscilloscope	Bandwidth: > 100MHz Vertical: ± 3% Horizontal: ± 3%	Tektronix Model 475A
5.5 Spectrum Analyzer	Residual Responses: < -120dBm Spurious Responses: < -80dB	Hewlett Packard Model 3580A
5.6 Digital Multimeter	DC Voltage: ± 0.05%	Fluke Model 8840A

SECTION 6
PRELIMINARY INSTRUCTIONS

6.1 Allow the TI to warm up in a stable environment for at least 30 minutes before beginning testing.

6.2 If a malfunction occurs or defect is observed while calibration is in progress, the calibration shall be discontinued and necessary corrective action effected: if corrective action affects a measurement function previously calibrated, this function shall be recalibrated before the remainder of the procedure is implemented.

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SECTION 7
DETAILED PROCEDURE

FREQUENCY

7.1.1 Connect Standard Counter input BNC, through a 50Ω load, to the hp8116A output BNC.

7.1.2 Set hp8116A as follows:

INPUT MODE	NORM
FUNCTION	SQUARE
DUTY CYCLE	50%
CTRL	OFF
AMPL	1V
OFFSET	0V
OUTPUT MODE	NORM

7.1.3 Set Standard Counter to frequency measurement

7.1.4 Set hp8116A frequency and verify counter frequency reading as follows:

hp8116A setting	Counter reading
50.0MHz	50.0000MHz ± 2500kHz
10.0MHz	10.0000MHz ± 500kHz
10.0kHz	10.0000kHz ± 300Hz
1.0kHz	1.00000kHz ± 30Hz

7.1.5 Set hp8116A frequency and verify counter period reading as follows:

hp8116A setting	Counter reading
1.00Hz	1.00000s ± 33.3ms
100mHz	10.00000s ± 333ms

PULSE WIDTH (pulse mode)

7.2.1 Verify equipment is still hooked up per step 7.1.1.

7.2.2 Set hp8116A as follows:

INPUT MODE	NORM
FUNCTION	PULSE
CTRL	OFF
FRQ	1MHz
AMP	1V
OFS	0V

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7.2.3 Set the Standard Counter to TI, COM A, CH A+,CH B-, Trig level 0V.

7.2.4 Set hp8116A width/frequency as shown and verify counter width reading.

Frequency	Width	Counter Reading
1MHz	100ns	93ns - 107ns
100kHz	1us	948ns - 1052ns
1kHz	100us	95us - 105us
10Hz	1ms	950us - 1050us
1Hz	500ms	475ms - 525ms

7.2.5 Connect the Standard Oscilloscope through a 50Ω load and 20dB pad to the hp8116A output BNC. Connect Oscilloscope for External Triggering.

7.2.6 Set hp8116A as follows:

FRQ 10.0MHz
WID 8.0ns

7.2.7 Set Oscilloscope such that one cycle fills the display. Verify that width is between 7.5 and 10ns.

AMPLITUDE AND OFFSET

7.3.1 Connect the Standard DMM input, through a 50Ω load, to the hp8116A output BNC.

7.3.2 Set hp8116A as follows:

INPUT MODE ..... NORM
FUNCTION ..... SINE
DUTY CYCLE 50%
CTRL ..... OFF
FRQ 1.0kHz
OFFSET 0V
OUTPUT MODE ..... NORM

7.3.3 Measure AC voltages as follows:

AMPL	Function	DMM Reading
8.00VAC	Sine W1	2.69 to 2.97VAC
	Triangle W2	2.19 to 2.43VAC
	Square W3	3.80 to 4.20VAC
3.00VAC	Sine	1.008 to 1.114VAC
	Triangle	0.823 to 1.575VAC
	Square	1.425 to 1.575VAC
1.00VAC	Sine	0.336 to 0.372VAC
	Triangle	0.275 to 0.303VAC
	Square	0.475 to 0.525VAC
100mVAC	Sine	33.6 to 37.1mVAC
	Triangle	27.4 to 30.3mVAC
	Square	47.5 to 52.5mVAC

7.3.4 Set hp8116A to NORM mode, Amplitude 100mV.

7.3.5 Using best DMM resolution, measure the dc voltages for the following hp8116A settings:

OFFSET	DMM Reading
7.5V (dc)	7.421 - 7.578V (dc)
5.00V	4.934 - 5.066V
3.00V	2.944 - 3.056V
1.00V	0.954 - 1.046V
100mV	58 - 142mV

7.3.6 Set hp8116A to amplitude 10mV and measure the voltages for the following hp8116A settings:

OFFSET	DMM Readings
795mV	783 - 804mV
500mV	491 - 509mV
100mV	95 - 105mV

SINE CHARACTERISTICS

7.4.1 Connect the Standard Spectrum Analyzer input to the hp8116A output BNC.

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7.4.2 Set hp8116A as follows:.

INPUT MODE	NORM
FUNCTION	SINE
DUTY CYCLE	50%
CTRL	OFF
FRQ	1kHz
AMPL	8V
OFFSET	0V
OUTPUT MODE	NORM

7.4.3 Tune spectrum analyzer for minimum display amplitude. Adjust gain so that fundamental corresponds to 0dB.

7.4.4 Verify that no harmonics exceed the 123dB level.

PULSE CHARACTERISTICS

7.5.1 Connect the Standard Oscilloscope through a 50Ω load and 20dB pad to the hp8116A output BNC. Connect Oscilloscope for External Triggering.

7.5.2 Set the hp8116A as follows:.

INPUT MODE	NORM
FUNCTION	SQUARE
DUTY CYCLE	50%
CTRL	OFF
FRQ	1MHz
AMPL	8V
OFFSET	0V
OUTPUT MODE	NORM

7.5.3 Set scope so that one cycle fills the display and measure:.

leading edge (risetime)	≤ 6ns
trailing edge (risetime)	≤ 6ns
preshoot	≤ ± 5% of amplitude
overshoot and ringing	≤ ± 5% of amplitude

FM MODE

7.6.1 Connect the Standard Oscilloscope input BNC to the hp8116A output BNC. Connect External Function Generator output to the hp8116A Control input BNC.

7.6.2 Set External generator to 10kHz, 2Vpp.

7.6.3 Set Oscilloscope to 0.1µs/div timebase, Magnification X10.

7.6.4 Set the hp8116A as follows:

INPUT MODE	NORM
FUNCTION	SQUARE
DUTY CYCLE	50%
CTRL	FM
FRQ	1MHz
AMPL	1V
OFFSET	0V

7.6.5 Check the delayed sweep for a typical jitter of 2 div ± 10%.

AMPLITUDE MODULATOR

7.7.1 Connect the Standard Spectrum Analyzer input to the hp8116A output BNC. Connect External Function Generator output to the hp8116A Control input.

7.7.2 Set the hp8116A

INPUT MODE	NORM
FUNCTION	SINE
DUTY CYCLE	50%
CTRL	AM
FRQ	10kHz
AMPL	1V
OFFSET	0V
OUTPUT MOD	NORM

7.7.3 Set Function Generator to 2kHz and 4.5Vpp amplitude, with 0.25V offset.

7.7.4 Adjust the Spectrum Analyzer to display the 10kHz carrier and the lower sideband frequency down to the 2kHz modulating frequency. All harmonics should be at least 42dB lower than the modulation sidebands.

DUTY CYCLE

7.8.1 Connect Standard Counter input BNC, through a 50Ω load, to the hp8116A output BNC.

7.8.2 Set hp8116A as follows:

INPUT MODE ..... NORM
FUNCTION ..... SQUARE
CTRL ..... OFF
AMP 1.0V
OFS 0.0V
OUTPUT MODE ..... NORM

7.8.3 .Set the counter to DTY CY A. Set hp8116A duty cycle / frequency as shown and verify counter duty cycle readings.

Frequency	Duty Cycle	Counter Reading
1Hz	10%	9.5% to 10.5%
	50%	49.5% to 50.5%
	90%	89.5% to 90.5%
1kHz	10%	9.5% to 10.5%
	50%	49.5% to 50.5%
	90%	89.5% to 90.5%
9.99MHz	20%	17.0% to 23.0%
	50%	47.0% to 53.0%
	80%	77.0% to 83.0%

DC VOLTAGE

7.9.1 Connect the Standard DMM input, through a 50Ω load, to the hp8116A output BNC.

7.9.2 Set hp8116A as follows:

INPUT MODE ..... NORM
FUNCTION ..... OFF
CTRL ..... OFF
OUTPUT MODE ..... NORM

7.9.3 Set hp8116A AMP and OFS values as shown and verify DMM reading.

Amp	OFS	DMM Reading
+ 100mV	+ 7.95V	+ 7.890V - + 8.010V
+ 100mV	+ 5.00V	+ 4.955V - + 5.045V
+ 100mV	+ 2.00V	+ 1.970V - + 2.030V
+ 100mV	0.00V	- 0.020V - + 0.020V
+ 100mV	- 2.00V	- 2.030V - - 1.970V
+ 100mV	- 5.00V	- 5.045V - - 4.955V
+ 100mV	- 7.95V	- 8.010V - - 7.890V

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7.9.4 Remove power from the equipment.

7.9.5 Disconnect the equipment from the TI (hp8116A).

SECTION 8
DOCUMENTATION INSTRUCTIONS

8.1 Enter data into CRIS system using Work Performed Screen.

8.2 Affix proper Calibration/Service due decal to Test Instrument as per Calibration Recall and Information System New CRIS User Guide.

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